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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,826	02/18/2005	Daniel Jansen	2001-1379	1882
<div>466 7590 10/14/2010</div> <div>YOUNG & THOMPSON</div> <div>209 Madison Street</div> <div>Suite 500</div> <div>Alexandria, VA 22314</div>				
<div>EXAMINER</div> <div>MERKLING, MATTHEW J</div>				
<div>ART UNIT PAPER NUMBER</div> <div>1723</div>				
<div>NOTIFICATION DATE DELIVERY MODE</div> <div>10/14/2010 ELECTRONIC</div>				

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

DocketingDept@young-thompson.com

Office Action Summary

Application No.

10/524,826

Applicant(s)

JANSEN ET AL.

Examiner

MATTHEW J. MERKLING

Art Unit

1723

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 May 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-25 and 27-39 is/are pending in the application.
- 4a) Of the above claim(s) 29-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-25, 27, 28 and 39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-06)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/14/2010 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 20, 22-25, 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vollmar et al. (US 6,162,556) in view of Koga (US 6,033,634) and Deckman et al. (US 6,830,596) and Kobayashi et al. (US 5,094,926).

Regarding claim 20, Vollmar discloses a method for converting CO from a feed (from the anode side of a fuel cell 4) and water into hydrogen (shift reaction, see abstract) wherein the feed (conduit 10) to the shift reactor (30) comprises anode off-gas (via conduit 10) from a fuel cell (4).

Vollmar teaches the use of a shift reactor on an anode off-gas stream and further discloses the use of a hydrogen separation apparatus (36) downstream of the shift reactor to separate the hydrogen from the carbon dioxide, but does not explicitly disclose the structure of the shift reactor. In other words, Vollmar fails to teach:

converting CO on one side of a membrane in the presence of water to CO₂ and H₂O on said one side of said membrane, H₂ passing through said membrane to the other side of said membrane and said hydrogen being combusted on said other side with oxygen fed to said other side.

Koga also discloses a shift reactor used for converting CO and H₂O into hydrogen and CO₂ (see abstract).

Koga teaches a membrane shift reactor which receives feed on one side of the membrane (in channel 8, see Fig. 1) and converts the CO in the feed in the presence of CO₂ and H₂O into H₂ and CO₂ (shift reaction, see abstract). Koga then teaches permeating the produced hydrogen through a membrane (12, 13, 14) and providing a

stream of hydrogen (see Fig. 1). In other words, Koga teaches an integrated shift reactor and hydrogen separation method.

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to integrate the hydrogen separation step and the shift reaction step of Vollmar (as taught by Koga) in order to provide a more compact system (with the combination of two structures into one). Furthermore, the use of one piece of construction (as taught by Koga) instead of the multiple pieces of construction (as taught by Vollmer) would be merely a matter of obvious engineering choice and would have been obvious to one of ordinary skill in the art at the time of the invention (see MPEP 2144.04 (V)(B)).

Furthermore, Vollmar, as modified above by Koga, teaches a shift/membrane reactor which produces a stream of hydrogen gas which can be used for a plurality of purposes (see col. 6 lines 2-5 of Vollmar). However, Vollmar does not teach feeding oxygen to said other side of said membrane and combusting the hydrogen on the permeate side of the membrane.

Deckman also discloses a membrane reactor which comprises a shift catalyst and separates the hydrogen from the reaction effluent by allowing only the hydrogen to permeate through the membrane (see abstract).

Deckman teaches feeding oxygen to the other side/permeate side of the membrane (via conduit 8) and combusting the hydrogen on the permeate side of the membrane in order to produce a gas which is discharged from the other side (via conduit 9) and can be used to power a turbine and generate electricity (see abstract).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the oxygen introduction step and the hydrogen combustion process step of Deckman, to the process of Vollmar, in order to produce a gas which can be used to power a turbine and generate electricity.

Furthermore, Vollmar, as modified by Deckman above, teaches combusting the hydrogen with air in order to produce an exhaust gas stream which is sent to a turbine, but does not explicitly disclose sending the exhaust gas stream to the fuel cell.

Kobayashi also discloses a method of operating a fuel cell (see abstract).

Kobayashi teaches a combustor (30) which combusts a portion of a combustible gas coming from a fuel cell anode (27) to generate an exhaust gas stream (52a). Kobayashi then teaches sending this combustion exhaust gas to the cathode of the fuel cell in order to most efficiently utilize the heat that is contained in the combustion exhaust gas stream and provide heat to the fuel cell (col. 3 lines 46-56).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to route the exhaust stream from the combustion reaction on the other side of the membrane of modified Vollmar, to the cathode side of the fuel cell (as taught by Kobayashi) in order to more efficiently use the heat that is contained in the combustion exhaust gas stream and provide heat to the fuel cell.

Regarding claim 22, Vollmar further discloses that non-combusted oxygen (from source 12) is fed to a cathode (22) of a downstream fuel cell (4).

Regarding claim 23, Vollmar further discloses that said oxygen comprises is from air (col. 6 lines 58-65).

Regarding claim 24, Vollmar, as modified above, further discloses water is separated off from the off-gas originating from said one side of said membrane (water is separated in 34).

Regarding claim 25, Vollmar further discloses the heat from the off-gas from at least one of the sides of said membrane is recovered (via heat exchanger 32, for example, see Fig. 1).

Regarding claims 27 and 28, Vollmar does not disclose gas containing water originating from the other side of said membrane is fed to a further step for converting CO on one side of a further membrane in the presence of water to give CO₂ and H₂O on the one side of said further membrane, H₂ passing through said further membrane to the other side of said further membrane. However, such a modification is nothing more than a duplication of the membrane disclosed by modified Vollmar and discussed above. Providing a duplicate membrane would amount to a mere duplication of parts and process steps and would have been obvious to one of ordinary skill in the art to further convert all CO. It has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

5. Claims 21 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vollmar et al. (US 6,162,556) in view of Koga (US 6,033,634) and Deckman et al. (US 6,830,596) and Kobayashi et al. (US 5,094,926) as applied to claim 20 above and further in view of Iio et al. (US 2002/0068204).

Regarding claims 21 and 39, Vollmar teaches a cathode off-gas which comprises air (col. 7 lines 35-43) but fails to teach that the oxygen used to combust the hydrogen comes from the cathode off-gas.

Iio also discloses a process in which the anode-off gas from a fuel cell is combusted to generate heat (see abstract).

Iio teaches combusting the hydrogen-containing anode off-gas with oxygen from the cathode off-gas as a means to supply oxygen to the combustion reaction (see paragraph 24).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to combust the hydrogen of modified Vollmar, with the cathode exhaust gas (which comprises air), as taught by Iio as a preferable means to provide oxygen to the hydrogen combustion reaction.

Response to Arguments

6. Applicant's arguments filed 5/14/2010 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment. More specifically, Applicants arguments are directed toward the new limitations that have been added to independent claim 20. Such limitations are addressed in the new grounds of rejection above.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew J Merkling/
Examiner, Art Unit 1723